

JORDANELLE RESERVOIR



Introduction

Jordanelle Reservoir is a newly created, large reservoir located on the Provo River about six miles north of Heber City. The reservoir at full capacity could store a total of 360,500 acre-feet of water covering a surface area of 3,300 acres. It was built to provide water storage at an upstream site to exchange for Bonneville Unit water in

Utah Lake and Strawberry Reservoir and for most of the water presently regulated in 16 small reservoirs on the headwaters of the Provo River. Most of these reservoirs will be stabilized at or near the original lake levels except for three reservoirs where dams will be reconstructed. Jordanelle Reservoir would function as a long-term

Characteristics and Morphometry

Lake elevation (meters / feet)	1,879 / 6,166
Surface area (hectares / acres)	1,336 / 3,300
Watershed area (hectares / acres)	137,530 / 339,833
Volume (m ³ / acre-feet)	
capacity	4.445 x 10 ⁸ / 360,500
conservation pool	
Annual inflow (m ³ / acre-feet)	2.46 x 10 ⁸ / 199,300
Retention time (years)	
Drawdown (m ³ / acre-feet)	
Depth (meters / feet)	
maximum	89 / 292
mean	33.3 / 109
Length (km / miles)	17.4 / 10.8
Width (km / miles)	1.6 / 1.0
Shoreline (km / miles)	40.2 / 25.0

Location

County	Wasatch
Longitude / Latitude	111 24 54 / 40 36 01
USGS Map	Heber City, Park City East, Francis, Ut, 1955
DeLorme's Utah Atlas & Gazetteer™	Page 54, B-1
Cataloging Unit	Provo River (16020203)

holding facility with water levels which fluctuate from year to year, depending on the demands by the water users and the offsetting spring flows. Recreation facilities were completed during the summer of 1995 which are managed as a State Park. Early indications reveal that usage of those facilities is extremely heavy as usage reaches its capacity during weekends. In addition a 10 megawatt powerplant is proposed for consideration at the

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dam. It impounds spring runoff from the western Uintas, storing it for use throughout the year. Construction of the Jordanelle Reservoir dams was initiated on June 27, 1987 and completed on April 12, 1993. The reservoir shoreline is publicly owned, and public access is unrestricted. The benefits of the reservoir include irrigation, municipal and industrial, fish and wildlife, recreation and flood control. The annual monetary benefits have been estimated to be in excess of \$100,000,000.00 annually.

Recreation

Jordanelle Reservoir is easily accessible from US-40, US-189 and U-32. Jordanelle State Park has been developed to ensure that the highest level of access is achieved within the park. Jordanelle State Park has been designed so that its programs and services (including interpretive programs, recreational programs, concession operated activities, and informational services) are accessible to a broad range of visitors, especially those people with disabilities. There are currently two developed components of the park, Rock Cliff and Hailstone sites. The first public facilities opened at the Rock Cliff site during the summer of 1994. Accommodations the public will enjoy include a nature center, elevated boardwalk systems, restrooms with individualized shower rooms, group-use pavilions, 50 walk-in camping sites and limited non-motorized trails. It is located on the Provo River at the east end of the reservoir.



Hailstone, a 200-acre tract of land located on the west shore of the reservoir, was developed as the primary access to the water. It opened during the summer of 1995. This area will function as the park headquarters. Facilities at this site include, camping areas, group pavilions, R.V. camping, marina with 76 slips, general store, restaurant, jet ski dock, two boat ramps, fish cleaning stations and access to several recreational trails.



This state park was developed with the vision that it would function as a year-round facility. During the winter months portions of the trails will be a crosscountry skiing trail complete with warming huts. In combination with a winter ice fishing program, winter concession operations and perhaps even winter camping, Jordanelle State Park will be able to offer the visitors year-round enjoyment.

The Division of Wildlife Resources expects Jordanelle Reservoir to provide an excellent rainbow trout and smallmouth bass sport fishery. The reservoir was initially stocked with 176,000 three inch rainbow trout in 1993 with additional supplemental stockings annually. The DWR also plans to establish a viable smallmouth bass fishery by the year 2000. Their plan is to introduce 250 pre-spawn adults annually (1994-98). If these fish cannot be obtained from Deer Creek Reservoir, then a request for 100,000 northern strain smallmouth fry from the U.S. Fish and Wildlife Service to supplement this introduction will be made. Special regulations may be required to promote and maintain an annual catch rate of 50,000 smallmouth at 12 inches or larger per year.

Watershed Description

Jordanelle Reservoir is an impoundment of the Provo River. The river has a long narrow watershed, from the Trial Lake area in the extreme western Uintas down into the southern end of Kamas (Rhodes) Valley, then down upper Provo Canyon into the Jordanelle Reservoir.

The area around the reservoir is sage-grass, oak, mahogany with aspen and evergreen forests on the mountains to the west of the reservoir.

The inclusion of the western Uintas into the Provo River's watershed is a result of several natural and man-made diversions. In fairly recent geological times, the Provo River only drained the Heber Valley. Upper Provo Canyon was an east-flowing tributary of the Weber River, and what is now the headwaters of the Provo River drained across Kamas Valley and down the Weber. As geologic tilting and faulting occurred, the Heber Valley

became topographically lower than Kamas Valley, and tributaries of the Provo River began capturing drainage from the Weber Basin. One of these tributaries began capturing the east flowing, present-day Upper Provo Canyon. It eventually captured that entire canyon (its east flowing tributaries are testament that the stream once flowed east) and reached the southern Kamas Valley and diverted the stream which is now called the Provo River into the Provo River drainage. Presently, the Provo River and Weber River both flow through Kamas Valley. The Provo has cut a narrow channel within the otherwise flat valley, but no further drainage has been captured. It appears that at the moment of human's brief presence in geologic time, the more difficult part of the capture (tough bedrock underlying Upper Provo Canyon) has occurred, but the Provo drainage has not made progress in capturing the remainder of the Weber River tributaries in Kamas Valley (underlaid by soft alluvial deposits), a process that should be nearly instantaneous. It has taken at least 10,000 years, however, because the width of Upper Provo Canyon clearly indicates it has carried glacial runoff.

Since Europeans arrived in the area, they have made two additional diversions to the headwaters of the Provo River. The first was the relatively simple diversion of Weber water across Kamas Valley to the Provo. This approximately doubled the watershed in the Uintas. Only a relatively small fraction of the Weber River is diverted, though. The second diversion involved tunnelling through the mountains between the Duchesne River and the Provo River. This diverts water from the Colorado River watershed to the Wasatch Front.

The natural watershed high point, Bald Mountain, is 3,640 m (11,943 ft) above sea level, thereby developing a complex slope of 3.7% to the reservoir (although higher points exist in the Duchesne River watershed). The average stream gradient above the reservoir is 3.2% (170 feet per mile). The inflow is primarily the Provo River supplemented with water from Drain Tunnel Creek and McHenry Creek. The outflow is the Provo River.

The watershed is made up of high mountains, low mountains, and valleys. The soil associations that compose the watershed are listed in Appendix III.

The vegetation communities consist of pine, spruce-fir, oak-maple, alpine tundra, and sagebrush-grass. The watershed receives 41 - 102 cm (16 - 40 inches) of precipitation annually. The frost-free season around the reservoir is 80 - 100 days per year.

Land use is primarily multiple use in USFS and BLM owned lands, and grazing of domestic livestock on privately owned lands. Private lands in the mid and upper reaches are primarily agricultural, suburban, and urban. The headwater area of the Duchesne River is in the High Uintas Wilderness.

Limnological Assessment

The water quality of Jordanelle Reservoir is very good. It is considered to be moderately hard with a hardness concentration value of approximately 92 mg/L (CaCO₃). The only parameters that have exceeded State water quality standards for defined beneficial uses are phosphorus and dissolved oxygen. Although the average water column concentrations of total phosphorus (38 ug/L) exceeds the State pollution indicator for phosphorus of 25 ug/L, it is not unusual to find elevated concentrations of total phosphorus during the early stages of a new reservoir. As soils and other sources of phosphorus are inundated with water concentrations throughout the water column become elevated as phosphorus goes into solution.

A review of the August 11, 1994 profile gives an indication of the oxygen deficiencies that are present. As

Limnological Data

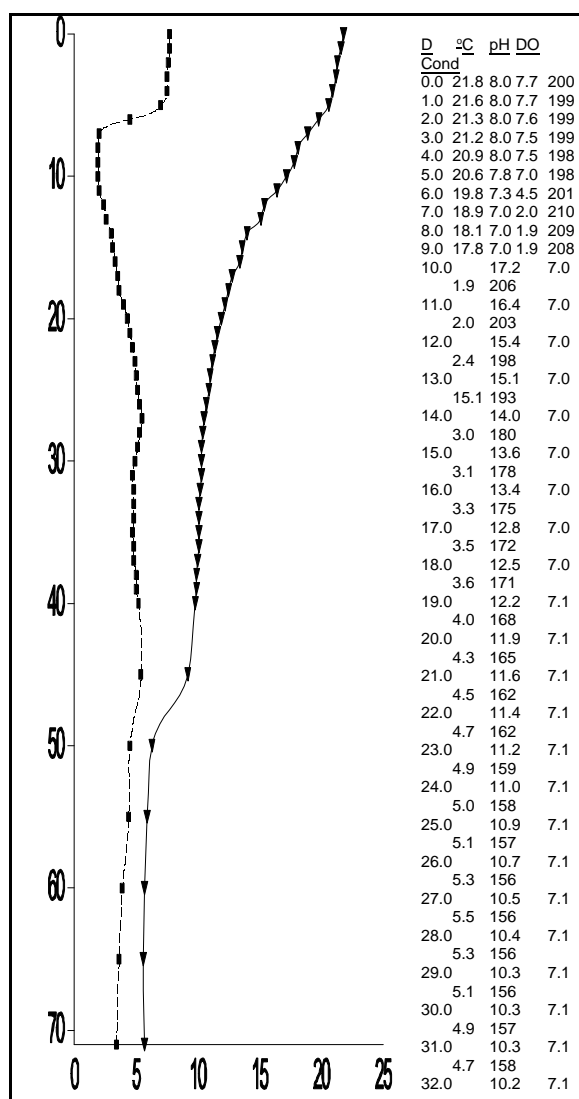
Data sampled and averaged from STORET sites: 591401, 591402, 591403, 591404.

Surface Data	1993*	1994
Trophic Status	M	M
Chlorophyll TSI	42.31	42.93
Secchi Depth TSI	41.15	40.46
Phosphorous TSI	48.19	51.09
Average TSI	43.88	44.82
Chlorophyll <i>a</i> (ug/L)	3.3	4.2
Transparency (m)	3.7	3.8
Total Phosphorous (ug/L)	21.8	29
pH	7.9	8.1
Total Susp. Solids (mg/L)	1.9	1.6
Total Volatile Solids (mg/L)	-	2.0
Total Residual Solids (mg/L)	-	2.0
Temperature (°C / °f)	17/63	20/68
Conductivity (umhos.cm)	162	199

Water Column Data		
Ammonia (mg/L)	0.03	0.03
Nitrate/Nitrite (mg/L)	0.14	0.05
Hardness (mg/L)	153	92.3
Alkalinity (mg/L)	85	92
Silica (mg/L)	-	-
Total Phosphorous (ug/L)	30	38

Miscellaneous Data		
DO (Mg/l) at 75% depth	-	4.4
Stratification (m)	-	11
Limiting Nutrient	N	N
Depth at Deepest Site (m)	-	71

*Data summary was not by period, but May through September by site



the reservoir filled large amounts of organic matter were covered with water. These materials require large amounts of oxygen as they decompose. This exerts a large demand on the dissolved oxygen present in the water column, which leads to a reduction of dissolved oxygen present in the water column. In addition if the hypolimnion becomes anoxic, larger amounts of phosphorus are released into the water column. These conditions may be short lived and as the reservoir ages conditions should stabilize and even improve. Continued monitoring will allow these assessments to be made. It does not appear that the water quality is significantly impaired, at this time. There are indications that winter monitoring should be conducted to determine if impairments are present under extended ice coverage conditions.

Current data suggest that the reservoir is currently a

nitrogen limited system. TSI values indicate the reservoir is mesotrophic in a state of moderate productivity. It would not be uncommon for the productivity of the reservoir to increase as additional land is inundated with water until some of the Limnological processes stabilize in the reservoir. Stratification in the lake will occur as conditions permit and the volume of the lake becomes more stable. The profile shown of August 11, 1994 does indicate a weak stratification developing near the 11 meter depth. As stratified conditions develop, dissolved oxygen concentrations and internal phosphorus loading may become more pronounced.

According to DWR no fish kills have been reported to date for the reservoir. The reservoir supports a population of brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*) and smallmouth bass (*Micropterus dolomieu*). The lake has not been treated for rough fish competition, so populations of native fishes from the Provo River are probably still be present in the lake. Current stocking reports indicate that DWR stocks the lake with fingerling rainbow trout and smallmouth bass.

Macrophytes are not typically present and are not a problem, however there is a lot of surface debris present which has surfaced as the land was covered with water.

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm ³ /liter)	% Density By Volume
<i>Chrysocapsa planktonica</i>		486.816
<i>Sphaerocystis schroeteri</i>	2.447	1.29
<i>Fragilaria crotonensis</i>	1.000	0.52
<i>Oocystis</i> sp.	0.133	0.07
<i>Asterionella formosa</i>	0.125	0.07
<i>Ankistrodesmus falcatus</i>	0.061	0.03
<i>Ankyra judayi</i>	0.047	0.02
Pennate diatoms	0.027	0.01
Total	190.656	
Shannon-Weaver	0.12	
Species Evenness	0.06	
Species Richness	0.27	

The phytoplankton community is dominated by the presence of yellow and green algae.

Pollution Assessment

Nonpoint pollution sources include the following: sedimentation and nutrient loading from grazing; urban runoff which may contain chemicals and nutrients from urban areas; herbicides and nutrients from cropland;

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wastes and litter from recreation; and some siltation from road construction during the late 1990's.

Point sources of pollution in the watershed include the Kamas Fish Hatchery.

Beneficial Use Classification

Jordanelle Reservoir currently is not classified but proposed state beneficial use classifications will probably include: culinary water (1C), recreational bathing (swimming) (2A), boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).

Information

Management Agencies

Mountainlands Association of Governments	377-2262
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146

Recreation

Mountainland Travel Region (Provo)	377-2262
Heber Chamber of Commerce	654-3666
Park City Area Chamber of Commerce	64526104
Jordanelle State Park Nature Center	783-3030
Utah Division of State Parks and Recreation	538-7220
Concessionaire Information	538-7320

Reservoir Administrators

Bureau of Reclamation	379-1000
Central Utah Water Conservancy District	226-7100